

forming a contact material comprising an aluminum bearing species or a titanium bearing species overlying the surface-treated backside to form a plurality of LED devices with the contact material such that the contact material forms an ohmic contact with the surface-treated backside of each of the plurality of LED devices. 5

11. The method of claim 10, wherein the backside surface is characterized by a nitrogen face of a c-plane, n-type GaN with carrier concentration ranging from $1 \times 10^{15}/\text{cm}^3$ to $1 \times 10^{20}/\text{cm}^3$; wherein the surface roughness ranges from about 0.3 nm to about 200 nm. 10

12. The method of claim 10, wherein the polishing process comprises use of a diamond slurry mixture characterized by a particle size from 0.05 microns to 5 microns.

13. The method of claim 10, wherein each of the plurality of pyramidal like structures is characterized by a height from 20 nm to 1000 nm. 15

14. The method of claim 10, wherein the solution comprises 0% to 20% by weight silicic acid hydrate, and 3% to 45% by weight potassium hydroxide in water. 20

15. The method of claim 14, wherein the backside surface is immersed in the solution for at least 1 minute at a temperature from 0° C. to 100° C.

16. The method of claim 10, wherein the plasma species comprises a silicon species and a chlorine species derived from a silicon tetrachloride gas source. 25

17. The method of claim 10, wherein the surface treatment comprises an HCl immersion for at least one minute.

18. The method of claim 10 further comprising subjecting the LED devices to a thermal treatment process to form the ohmic contact between each LED device and the contact material. 30

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